Use of 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-4-yl butanoate for controlling acarids

The present invention relates to the use of 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate for controlling acarids in hops, kiwi fruit, soft fruit, nuts, coffee, tropical fruit, spices and conifers.

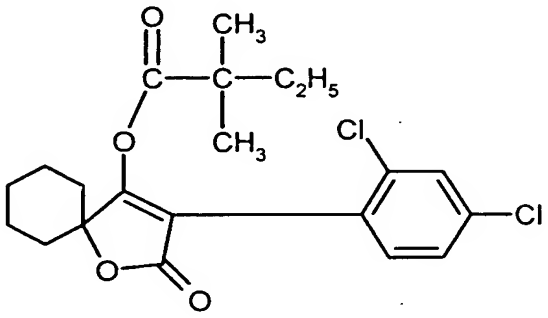
The compound 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate is known from EP-A-528 156.

The acaricidal activity of 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate is also known from EP-A-528 156.

Surprisingly, it has now been found that 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate is particularly suitable for controlling acarids in hops, kiwi fruit, soft fruit, nuts, coffee, tropical fruit, spices and conifers.

Accordingly, the present invention relates to the use of 2,2-dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate for controlling acarids in hops, kiwi fruit, soft fruit, nuts, coffee, tropical fruit, spices and conifers.

2,2-Dimethyl-3-(2,4-dichlorophenyl)-2-oxo-1-oxaspiro[4.5]dec-3-en-yl butanoate has the following formula (I):



(I)

The preparation of the compound of the formula (I) is described in EP-A-1 272 480.

The compound of the formula (I) can preferably be used for controlling arthropods

from the class of the Arachnida, for example Scorpio maurus, Latrodectus mactans, Acarus siro, Argas spp., Ornithodoros spp., Dermanyssus gallinae, Eriophyes ribis, Phyllocoptruta oleivora, Boophilus spp., Rhipicephalus spp., Amblyomma spp., Hyalomma spp., Ixodes spp., Psoroptes spp., Chorioptes spp., Sarcoptes spp., Tarsonemus spp., Bryobia praetiosa, Panonychus spp.,

Tetranychus spp., Hemitarsonemus spp. and Brevipalpus spp. It is especially preferred to control Panonychus spp. and Tetranychus spp.

The compound of the formula (I) can preferably be employed in hops; kiwi fruit; soft fruit such as, for example, currant, gooseberry, raspberry, blackberry, strawberry, blueberry; nuts such as, for example, almonds, pistachios, beech, cashew nuts, hazelnuts, brazil nuts, butter nuts, chestnut, hickory nuts, macadamia nuts, pecan nuts, coconuts, walnuts; tropical fruits such as, for example, mango, papaya, dates; coffee and spices such as, for example, chilli; and conifers such as, for example, spruces and firs.

These plants can be obtained by traditional breeding and optimization methods or else by biotechnological methods and genetic engineering methods or combinations of these methods, including the transgenic plants and including the plant varieties which are capable or not capable of being protected by Plant Breeders' Rights. Plant parts are understood as meaning all aerial and subterraneous parts and organs of the plants, such as shoot, leaf, flower and root, examples which may be mentioned being leaves, needles, stalks, stems, flowers, fruiting bodies, fruits and seeds, and also roots, tubers and rhizomes. The plant parts also include harvested material and vegetative and generative propagation materials, for example cuttings, tubers, rhizomes, slips and seeds.

The inventive treatment of the plants and plant parts with the active ingredients is carried out directly or by acting on their environment, habitat or store, using the customary treatment methods, for example by dipping, spraying, atomizing, misting, scattering, painting on and, in the case of propagation material, in particular seeds, furthermore by coating with one or more coats.

The active ingredient of the compound of the formula (I) can be converted into the customary formulations, such as solutions, emulsions, wettable powders, suspensions, powders, dusts, pastes, soluble powders, granules, suspoemulsion concentrates, natural and synthetic materials impregnated with active ingredient, and ultrafine encapsulations in polymeric substances.

These formulations are produced in a known manner, for example by mixing the active ingredients with extenders, i.e. liquid solvents and/or solid carriers, if appropriate using surface-active agents, i.e. emulsifiers and/or dispersants and/or foam-forming agents.

If water is used as extender, it is also possible to use for example organic solvents as cosolvents. Liquid solvents which are suitable are essentially: aromatics such as xylene, toluene, or alkylnaphthalenes, chlorinated aromatics and chlorinated aliphatic hydrocarbons such as chlorobenzenes, chloroethylenes or methylene chloride, aliphatic hydrocarbons such as cyclohexane or paraffins, for example mineral oil fractions, mineral and vegetable oils, alcohols

such as butanol or glycol and their ethers and esters, ketones such as acetone, methyl ethyl ketone, methyl isobutyl ketone or cyclohexanone, strongly polar solvents such as dimethylformamide and dimethyl sulfoxide, and water.

Solid carriers which are suitable are:

for example ammonium salts and ground natural minerals such as kaolins, clays, talc, chalk, quartz, attapulgite, montmorillonite or diatomaceous earth and ground synthetic minerals such as highly disperse silica, alumina and silicates; solid carriers which are suitable for granules are: for example crushed and fractionated natural rocks such as calcite, marble, pumice, sepiolite, dolomite, and synthetic granules of inorganic and organic meals, and granules of organic material such as sawdust, coconut shells, maize cobs and tobacco stalks; suitable emulsifiers and/or foam-forming agents are: for example nonionic and anionic emulsifiers such as polyoxyethylene fatty acid esters, polyoxyethylene fatty alcohol ethers, for example alkylaryl polyglycol ethers, alkylsulfonates, alkyl sulfates, arylsulfonates and protein hydrolyzates; suitable dispersants are: for example lignin-sulfite waste liquors and methylcellulose.

Adhesives such as carboxymethylcellulose, natural and synthetic polymers in the form of powders, granules or latices such as gum arabic, polyvinylalcohol, polyvinyl acetate, and natural phospholipids such as cephalins and lecithins and synthetic phospholipids may be used in the formulations. Further additives can be mineral and vegetable oils.

Colors such as inorganic pigments, for example iron oxide, titanium oxide, Prussian Blue, and organic dyestuffs, such as alizarin, azo and metal phthalocyanin dyestuffs and micronutrients such as salts of iron, manganese, boron, copper, cobalt, molybdenum and zinc can be used.

In general, the formulations comprise between 0.1 and 95% by weight of active ingredient, preferably between 0.5 and 90%.

The active ingredient content of the use forms prepared from the commercially available formulations can vary within wide ranges. The active ingredient concentration of the use forms can be from 0.0000001 up to 95% by weight of active ingredient, preferably between 0.0001 and 1% by weight.

They are applied in a customary manner which is adapted to suit the use forms.

Use examples

Example A

Pest: Tetranychus urticae

Crop: Hops

The compound of the formula (I) (240SC) was tested at a concentration of 0.0048% a.i. in comparison with cis-cyhalothrin (050EC) at 0.005% a.i. The compound of the formula (I) was used at an early stage of the infestation of the pest, while cis-cyhalothrin was applied when the infestation had progressed to a high level.

The spray mixture (2000 l/ha) was applied using a knapsack sprayer operated with compressed air.

The plot size was 6 plants, the number of replications per test variant was 2.

The activity against spider mites was determined 4, 14 and 21 days (compound of the formula (I)) and 4, 11 and 18 days (cis-cyhalothrin) after the treatment by counting the live animals/leaf (10 leaves/plot) and calculating the efficacy using Abbott's formula.

Table A

Tetranychus urticae / Hops

Active ingredients	**Concentration**	**Efficacy in % Abbott**				
	% a.i./ha	4*	11*	14*	18*	21*
Compound of the formula (I) (240 SC)	0.0048	90		94		93
Cis-cyhalothrin (050 EC)	0.005	59	57		0	

* Days after treatment

Example B

Pest: Tetranycus urticae

Crop: Hops

The compound of the formula (I) (240 SC) was tested at a concentration of 0.0144% a.i. in comparison with the standard Amitraz (200 EC) at 0.05% a.i. The mixture was sprayed once.

The spray mixture (2200 l/ha) was applied using a trailed machine operated by a tractor. The plot size was 60 plants, and 2 replications were carried out per test variant.

The activity against spider mites was determined 5, 12, 19 and 34 days after the treatment by counting the live animals/leaf (60 leaves/plot) and calculating the efficacy using Abbott's formula.

Table B

Tetranychus urticae / Hops

Active ingredients	**Concentration**	**Efficacy in % Abbott**		
	% a.i./ha	5*	12*	19*
Compound of the formula (I) (240 SC)	0.0144	89.7	98.1	99.6
Amitraz (200 EC)	0.05	80.1	96.3	92.2

* Days after treatment

Example C

Pest: Tetranychus urticae

Plant: Black walnut tree

The compound of the formula (I) (240 SC) was tested at a concentration of 2.02 ounces a.i. per 100 gallons (= 0.126 pounds a.i. per acre) in comparison with PYRAMAT (Pyridaben, 75 WP) at an application rate of 0.125 pound a.i. per acre.

The spray mixture (100 gallons per acre) was applied by means of a motor-operated hand-held sprayer.

The test was carried out with one tree per plot and three replication experiments.

The efficacy against spider mites was calculated by counting the live eggs and nymphs on eight leaves per tree before and one, two and six weeks after the application and subsequently calculated using the formula of Henderson & Tilton.

Compound	Application rate in pounds of a.i. per acre	Efficacy in Henderson&Tilton % against EGGS		
		1 WAA	2 WAA	6 WAA
Compound of the formula (I) (240 SC)	0.126	100	100	64
PYRAMITE (75 WP)	0.125	93	73	0

Compound	Application rate in pounds of a.i. per acre	Efficacy in Henderson&Tilton % against NYMPHS		
		1 WAA	2 WAA	6 WAA
Compound of the formula (I) (240 SC)	0.126	100	100	83
PYRAMITE (75 WP)	0.125	99	94	79

Example D

Pest: Eotetranychus hicoriae

Plant: Pecan nut tree

The compound of the formula (I) (240 SC) was tested at an application rate of 0.313 lb a.i. per acre in comparison with ACRAMIT (Bifenazate, 50 WP) at 0.50 pound of a.i. per acre.

The spray mixture (105 gallons per acre) was applied by means of a motor-operated hand-held sprayer.

The experiment was carried out with one tree per plot and four replication experiments.

The efficacy against the pecan leaf scorch mite was determined by counting the number of live mites on five leaves per tree 6 and 13 days after the application and subsequently calculated by means of the Abbott formula.

Compound	Application rate in pounds a.i. per acre	Efficacy in Abbot % 6 DAA	13 DAA
Compound of the formula (I) (240 SC)	0.313	100	80
ACRAMITE (50 WP)	0.5	86	20